

INSIDER

Newsletter for the Employees of Ames Laboratory ■ Volume 19, Number 1 ■ January 2008

A Conversation with Alex King

New Lab director discusses opportunities, challenges and what surprised him about Ames Lab

Alex King, who began his appointment as Ames Laboratory director on Jan. 1, sat down with *Insider* to talk about his plans for the Lab's future and his first impressions of Ames Lab and the Ames community.

Right now Ames Lab is a \$30 million lab. How does the Lab grow its budget?

There is no single easy answer to that question. We are an Office of Science lab, and the greatest part of our funding comes from the Office of Basic Energy Sciences. While we continue to hope that the agenda of doubling the budget for physical science research in the United States will bear fruit, we also understand that initiatives like the American Competitiveness Act often fail to win funds in the congressional appropriations process.

So what do we do? We will continue to push for full funding for the Office of Science, and we will protect our traditional strengths in the basic sciences so we are well positioned in case there is a federal windfall.

Realistically, however, the more reliable sources of funding for expansion will probably lie outside of BES in the next



few years as elections, recessions and other federal priorities take their toll. I expect that a growing fraction of our funding will come from applications of the basic research that we do so well. As the development time scale (from research to product) gets shorter and shorter, we need to be more attuned to this kind of activity and seek funding for applications both within the federal govern-

ment and from other sources.

Whatever we do, however, it must continue to be based upon the excellent collaborative fundamental science that the Lab does so well.

What are your goals for your first year? Are there any changes on the horizon?

DOE is calling for some changes in the way we organize our research programs at the

level of individual field work proposals, so there will be some new roles to be filled as we respond to that.

In a more general sense, I want the Lab to be more connected to our constituencies, with a very strong and consistent presence in Washington and Germantown. There is also a growing connectedness among all of the labs at the director level with the creation

continued on page 2

A Conversation with Alex King *continued from page 1*

of the National Laboratories Directors' Council, and I intend to play an active role in that.

Beyond those, I want the Lab to be better connected with the state and federal government, with industry and with foundations who can partner with us in meeting shared goals.

What are the main challenges facing Ames Lab in the future?

Funding stability is probably the most obvious issue. We also need to replace some seriously aging facilities. And the growth in bureaucracy and the number of directives coming from DOE presents occasional challenges in keeping focused on the science.

Our relationship with ISU is entering a period of change, too, as the campus adopts a new budget model, including indirect-cost return to principal investigators and other features that may affect us. We certainly need to make that relationship work to the benefit of both organizations and avoid falling into the trap of

competing with each other as we weather these changes.

How do you envision the future relationship between Ames Lab and IPRT?

Another set of ongoing changes. The separation of the two organizations really becomes complete with my appointment as director. Tom Barton held both jobs, but DOE insisted that they be separated when the new contract to run the Lab was awarded to ISU. Obviously the two organizations are still very close and have overlapping goals. There are many research programs that have components in both organizations.

As with our relationship to ISU, this is a developing thing, and we need to find ways to collaborate and cooperate. George Kraus and I are already enjoying bouncing ideas off one another, and I think there is a healthy future between the two institutes.

What has surprised you about Ames Lab?

Probably the biggest thing is the immense depth of talent here. I knew about many of the higher-profile research programs before I got here, but the number of additional layers that have yet to rise to the same prominence is really very impressive indeed.

What got you interested as a young man in materials science?

I'm not sure that I remember. I chose my undergraduate major (like all British school kids of the day) before I even got to college, and I'm not sure I remember what I based the choice upon.

What I learned early on, however, was an appreciation for the multitude of ways in which the structure of materials controls their properties. I never seem to run out of new examples to explore and get excited about.

What has impressed you about the Ames and Iowa State community?

My wife, Chris, and I have never lived in a place where people are quite as friendly.

We've lived in the United Kingdom, where people don't actually say "have a nice day." We've lived in Boston, where they seem to say "have a nice day" to see what your reaction will be. We've lived in Long Island where they can sometimes say it almost like a threat, and we've lived in Indiana where they say it sort of like a liturgical response.

Here in Iowa, I get the feeling that people actually mean it. Iowa folks have a reputation for being friendly, but I didn't really expect it to be quite like this.

What do you enjoy doing in your free time?

In what little there is, I like to travel, especially to places where I can use my scuba certification. I enjoy photography, and I collect vintage guitars, especially if they are made out of unusual materials. ■



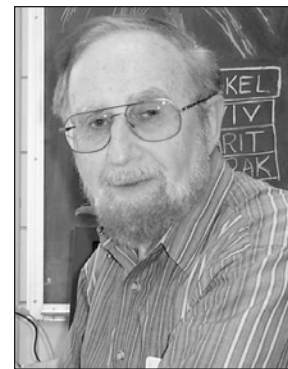
Welcome to the Club

Eight Employees Honored for Years of Service

Eight Lab employees will be honored for their years of service at the annual ISU 25-Year Club banquet on Feb. 21. Karen Huiatt, account specialist; Mark Murphy, division director for Technical and Administrative Services; Marit Nilsen-Hamilton, associate scientist; Vicki Johnson, administrative specialist; Marshall Luban, senior physicist; and Gary Walter, storekeeper, will be recognized

for 25 years of service. Richard Larock, associate scientist, and Edward Yeung, senior chemist, will be honored for 35 years of service.

The ISU 25-Year Club, established in 1934, honors the loyal service of Iowa State University faculty and staff. Nearly 100 ISU staff members will join the 25-Year Club this year. ■



Marshall Luban



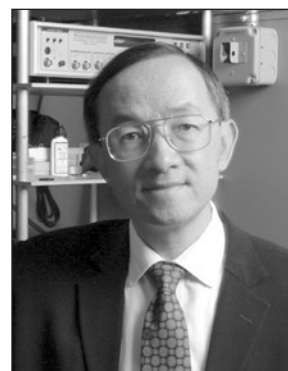
Vicki Johnson



Gary Walter



Richard Larock



Edward Yeung



Marit Nilsen-Hamilton



Mark Murphy



Karen Huiatt
"To celebrate working at Ames Lab for 25 years, I don't want to do a normal photo," said Huiatt, account specialist. "I want to do a fun picture!" Huiatt, or shall we say "the princess of payroll & timekeeping" (note her tiara) poses with the tools of her trade: an absence request form, a calculator and chocolate bars.



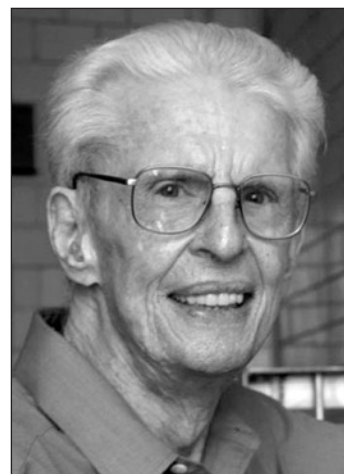
Holiday Auction Proceeds Presented to Shop With a Cop
Public Affairs manager Steve Karsjen, left, presents Ames Police Sergeant Tom Shelton with a check for \$4,205 for the Ames Police Benevolent Association's Shop with a Cop program. The donation was raised during the Ames Lab and IPRT Holiday Auction in December.

Corbett Receives Terrae Rarae Award

John Corbett, senior chemist, received the 2007 Terrae Rarae Award (Latin for "rare earth") at the 21st meeting of Tage der Seltenen Erde ("Days of the Rare Earths") in Cologne/Bonn-Roettgen, Germany.

The Terrae Rarae Award, for special merit in rare-earth research, was "in appreciation of Corbett's life's work and with special recognition of his outstanding work in the area of reduced rare-earth-element halides and related compounds."

The prize is supported by Treibacher Industrie GmbH in Althofen, Austria. ■



John Corbett

Luban and Fox Named APS Fellows

Marshall Luban, senior physicist, and Rodney Fox, associate, have been named fellows of the American Physical Society.

Luban, who is also an ISU associate professor of physics and astronomy, was honored "for long-term significant contributions to condensed matter theory, including pioneering work on the Lifshitz multicritical point, on Bloch oscillations of electrons in semiconductor superlattices, and the modeling of magnetic molecules."

Fox, Herbert L. Stiles Professor of Chemical Engineering, was honored "for ground-breaking contributions to the field of turbulent reacting flows."

The number of APS fellows selected each year is limited to one percent of the total APS membership. ■



Marshall Luban



Rodney Fox

January 2007

Metamaterials Found to Work for Visible Light

Senior physicist Costas Soukoulis created a metamaterial, or left-handed material, with a negative refractive index for visible light. The discovery was reported in the January issues of *Science*, *Optic Letters* and *Nature*.

High School Science Bowl a Success.

Iowa City Regina came out on top at the annual Ames Lab/ISU High School Science Bowl, beating 47 other teams to earn a trip to the DOE National Science Bowl competition.



February 2007

Gschneider Elected to National Academy of Engineering

Karl Gschneider, senior metallurgist, was elected to the prestigious National Academy of Engineering in honor of his outstanding "contributions to the science and technology of rare-earth materials."



Tom Barton Steps Down

After leading Ames Lab for 19 years, Tom Barton stepped down to return to teaching in ISU's Department of Chemistry.



June 2007

New Screening Method to Find Better Biofuel Crops

Analytical chemist Emily Smith uses Raman imaging to study plant cell structure to determine which crops offer the best composition to maximize the materials' conversion to ethanol.



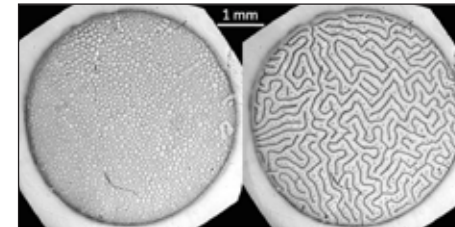
SULI Program Brings 11 Interns to Lab

Eleven science and engineering students participated in the third annual Science Undergraduate Laboratory Internship program.

July 2007

New Look of Superconductivity

Physicist Ruslan Prozorov discovered a supraflow or tubular equilibrium pattern in superconducting lead, marking a departure from the model laminar equilibrium pattern that has appeared in physics textbooks for 70 years.



ACTS Program Helps Create Teacher Scientists

Nine middle school teachers participated in the newly created DOE Academies Creating Teacher Scientists program at the Lab. The summer program is designed to give teachers the skills to develop dynamic and innovative science programs at their schools.

August 2007

Under Secretary Orbach Visits Lab

DOE Under Secretary for Science Dr. Raymond Orbach visited campus to deliver the keynote address at ISU's summer commencement exercises and to tour Ames Laboratory.



LOOKING TO THE FUTURE

October 2007

Alexander H. King Named New Lab Director

Alex King was named director of the Ames Laboratory effective Jan. 1, 2008. King is only the fourth director to lead the Lab in its 60 years of existence.



March 2007

Alan Goldman Named Interim Lab Director

Alan Goldman, division director for Science and Technology, was named interim director effective March 1.

A 14-member search committee was formed to select a new permanent director.

Lab Launches New Research Program

Simulation, Modeling and Decision Science was added to the list of Lab research programs. Under the direction of Mark Bryden, Simulation, Modeling and Decision Science researchers create computer applications that convert 3-D data sets into virtual models.

April 2007

Young Scientists "Off to the Races"

Students from around the state came to the Middle School Science Bowl to race hydrogen fuel-cell cars and to compete in the academic quiz-bowl tournament.

VEISHEA Display Highlights Lab's History

Ames Lab and IPRT co-hosted a VEISHEA open house display featuring time lines of both organizations' histories.



CELEBRATING OUR HISTORY

May 2007

Lab Celebrates 60th Anniversary

In honor of Ames Lab's 60th anniversary, Gov. Chet Culver proclaimed May 17, 2007, Ames Laboratory Day in Iowa. The Ames Lab community celebrated the anniversary at a 1950s-themed party complete with a live band, cake and ice cream, and a dunk tank.



Physicists Rethink Zinc

Physicists Paul Canfield and Sergey Bud'ko along with graduate student Shuang Jia discovered a new family of zinc compounds that can be tuned to take on the properties of other materials.

September 2007

Lab named FLC Outstanding Lab

The Federal Laboratory Consortium named Ames Lab the 2007 Outstanding Laboratory for the Mid-Continent Region in recognition of the Lab's exceptional transfer of technologies to other research organizations and to the private sector.



Gschneider Wins Top Materials Award

Karl Gschneider, senior metallurgist, was awarded the Acta Materialia Gold Medal, considered by many to be the top award in the field of materials research.

November 2007

Corbett Honored with ACS Cotton Award

John Corbett was awarded the American Chemical Society 2008 F. Albert Cotton Award in Synthetic Inorganic Chemistry. With the F. Albert Cotton award, Corbett has now won all three ACS inorganic chemistry awards.

Lab Participates in DOE Day of Science

Ames Lab participated in the DOE Day of Science event, an annual symposium for high-potential science students sponsored by the DOE and Oak Ridge National Laboratory.



December 2007

Lab raises \$4,205 for Shop With a Cop

The Ames Lab and IPRT communities raised a record-breaking \$4,205 for the Ames Police Benevolent Association's Shop with a Cop program. The 2007 Shop with a Cop event took 75 kids shopping to buy gifts for themselves and their family members.



New Model Explains How Fuel-Cell Membrane Works

Chemists Klaus Schmidt-Rohr and Qiang Chen developed a new model of the polymer film Nafion® that offers the best explanation to date for how proton exchange membranes in fuel-cells work.

"Beefing" Up Magnets For Electric Drive Cars

New Magnet Alloy Stays Strong - Even at 200 Degrees Celsius

Ask Iver Anderson about consumer interest in and desire for “ultragreen” electric-drive vehicles, and he’ll reply without a moment’s hesitation that the trend is unstoppable and growing fast.

The Ames Lab senior metallurgist and Iowa State University adjunct professor of materials science and engineering is playing a major role in advancing electric drive motor technology to meet the enormous swell in consumer demand expected over the next five years. He and his Ames Lab colleagues, Bill McCallum and Matthew Kramer, have designed a high-performance permanent magnet alloy that operates with good magnetic strength at 200 degrees Celsius, or 392 degrees Fahrenheit, to help make electric drive motors more efficient and cost-effective. The work is part of the DOE’s Vehicle Technologies Program to develop more energy-efficient and environmentally friendly highway transportation technologies that

“We need to support our auto companies and help them develop better products. We can do that by getting things worked out at the basic science end – that’s our job.”

will enable America to use less petroleum.

Anderson explains that future ultragreen vehicles include fully electric cars, fuel-cell automobiles and plug-in hybrids.

“They all have electric drive motors, so that’s a common theme,” he says. “It’s

important that those motors be made economically with an operating envelope that fits how they will be driven. The automotive companies in this country have set out a series of parameters that they would like electric motors to meet.”

One of those constraints being addressed by Anderson and his colleagues is the need for permanent-magnet electric motors to operate well at temperatures up to 200 degrees Celsius.

“That raised a lot of eyebrows for people who know anything about magnets,” says Anderson.

He explains that the most desirable permanent-magnet materials are neodymium-iron-boron magnet materials based on a 2-14-1 crystal structure – Nd₂Fe₁₄B.

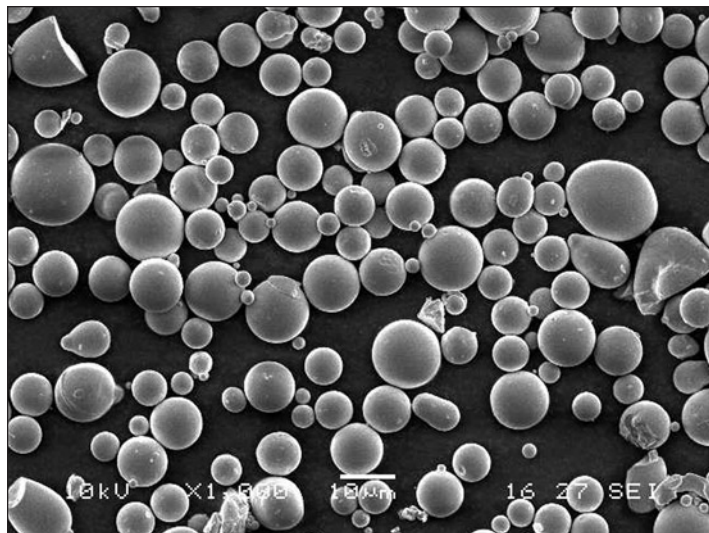
“Most of those types of magnets tend to lose a lot of their magnetic energy at fairly modest temperatures and are operating at much less than half of their power by the time they reach 100 C to 125 C,” he says. “So our challenge was to design a high-performance 2-14-1 permanent magnet alloy that would operate with good magnetic strength at 200 C.”

Meeting that challenge, Anderson, McCallum and Kramer designed an alloy that replaces pure neodymium with a mixed rare earth.

“We used a combination of neodymium, yttrium and dysprosium because they all form 2-14-1 crystal structures,” says Anderson. “Together they have much less degradation of their magnetic properties with temperature due to the influence of the yttrium and



Iver Anderson



These fine, spherical 2-14-1 permanent magnet alloy powders produced by argon gas atomization may lead to more efficient and economical electric drive motors for ultragreen vehicles.

dysprosium. Our concept, put forth in our patent application, is that the mixed rare earth 2-14-1 phase would have a lower temperature coefficient.” (The relative change of a physical property, e.g., coercivity, when the temperature is changed by 1 kelvin.)

Once they had tweaked the new alloy to perfection, the next thing the researchers did was process it in a fine, spherical powder form using gas atomization, a technique in which kinetic energy from supersonic jets of gas is transferred to a stream of liquid metal, causing it to break up into droplets.

“This method best fits the needs of the automobile industry because they want to make their motors by a very high-volume manufacturing process, and that method is injection molding,” explains Anderson. Injection molding is a process for forming objects from a blended mixture of plastic and metal powder by heating this molding compound to a fluid state and injecting it into a mold.

Stressing the importance of being able to use the injection-molding manufacturing process, Anderson says, “Currently, each magnet making up the magnet array in an electric motor is glued in by hand.”

“That’s fine for small runs of 50,000 automobiles, but try doing that for the millions of cars with electric drive motors – one for the front and one for the back – that consumers will want to buy in the next 10 years,” he says. “It’s not going to work.”

Anderson and his colleagues have been refining and pushing the 2-14-1 alloy composition to be more suitable for the rapid solidification that happens in the atomized powder droplets and ultimately for the injection-molding process.

“We’ve succeeded in getting very nice properties for these fine spherical powders,” he says.

He notes that in comparing their powders to spherical commercial powders of larger size, he and his colleagues look at the “crossover in temperature” at which the properties of their magnet

"Beefing" Up Magnets For Electric Drive Cars *continued from page 6*

powders become better than the commercial powders for higher temperature uses.

“It used to be 175 C,” he says, “but now we’ve moved that cross-over temperature down to the neighborhood of 75 C, which is a tremendous accomplishment – we’re very happy about that.”

Anderson says they now have what they think is a really good alloy, and they also have switched from helium gas to argon gas in the atomization process, which makes the powder-making process a lot cheaper.

“That’s a move in the right direction for the purposes of commercialization,” he says, “and that’s what we’ve been driving for.” (No pun intended.)

Reflecting on the goals of the Vehicle Technologies Program, Anderson says, “We need to support our auto companies and help

them develop better products. We can do that by getting things worked out at the basic science end – that’s our job.”

Summing up the effort he and his colleagues have made in that regard, he adds, “You can think of this alloy design work as the fundamental end of extending the temperature range of 2-14-1 magnet alloys. Then, we’re also working on the process end, which is a fundamental rapid solidification effort to develop the solidified microstructure that will carry the best magnetic properties over in a form that can be mass-produced. You can call this ‘use-inspired’ research, for sure. And there’s an urgent need for this in our society.” ■

~ Saren Johnston

Join Noontime Exercise Group to Jump Start Fitness



Vickie Hahn, third from left, leads the noontime exercisers group.

Did you make a New Year’s resolution to get in shape? If so, joining the Ames Lab noontime exercisers group may be a good place to start. The group, led by Vicki Hahn in Occupational Medicine, meets every Monday and Thursday from noon to 1 p.m. to do gentle aerobics in the form of walking or exercise videos.

“We try to keep it interesting by walking and discovering new parts of campus in good weather and by trying different exercise videos in bad weather,” Hahn says.

Noontime exercisers also have access to some light free weights and exercise bands for strength training.

“The noontime exercise group is a great way to begin an overall fitness plan,” says Hahn. “We work on total body fitness, and we work at a pace that’s comfortable for beginning exercisers.”

Participation is open to everyone in the Ames Lab community. Call Vicki Hahn at 294-6837 to sign up or to learn more. ■

Need Fitness Inspiration? Look in G11 TASF.

Those looking for fitness inspiration need to look no farther than G11 TASF where they’ll find Vicki Hahn, a nurse in Occupational Medicine. But don’t come over the lunch hour, because she’ll be either leading the Lab’s noontime exercise group or playing racquetball at Beyer Hall. You also won’t see her in her office for her morning break because she’s out walking the halls of Gilman and Spedding.

“I really like being active,” she says. “It doesn’t seem like work if you enjoy what you’re doing.”

“The way I see it, as the years pass, I may no longer be able to do some of these fun activities,” adds Hahn. “So, I’m not going to wait. I’m going to walk, bike and play racquetball today.”

In other words, “carpe diem.” Sounds like the perfect inspiration to start exercising today. ■

Make a Valentine's Day Date With Your Heart

Occupational Medicine will be offering blood pressure checks to employees on Thursday, Feb. 14, from 2 p.m. to 4 p.m. Heart healthy information and treats will also be available.

Call for 2008 Enrico Fermi Award Nominations

The DOE has issued a call for nominations for the 2008 Enrico Fermi Award, one of the oldest and most prestigious science and technology awards given by the U.S. government. To learn more or to make a nomination, visit: <http://www.sc.doe.gov/fermi/>. The nomination deadline is April 1.

New Lactations Stations in TASF and Spedding

Wondering about the new stickers on the doors of the first floor women's restroom in TASF and the ground floor women's locker room in Spedding? The stickers designate the rooms as lactation facilities.

According to Deb Covey, Ames Lab's representative to the University Committee on Women, the Lab established the "lactation stations" to accommodate women students, faculty and staff on the north side of campus.



INSIDER

Volume 19 / Number 1 / January 2008

Ames Lab Insider is published 11 times a year for the employees of the Ames Laboratory by the Office of Public Affairs and Information. Ames Laboratory is operated by Iowa State University (ISU) for the U.S. Department of Energy (DOE) under Contract DE-AC02-07CH11358.

Address comments to:
Editor, **INSIDER**
111 TASF
Ames, IA 50011-3020
515/294-9557
FAX 515/294-3226

Address correction requested
P-208-9

Editor Breehan Gerleman Lucchesi
Layout Tiffany Woods



Printed on
Recycled Paper